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U.S. Department of Energy
Idaho Operations Office

Long-Term Monitoring Plan for Operable Unit 3-13, Group 5, Snake River Plain Aquifer

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Long-Term Monitoring Plan for Operable Unit 3-13, Group 5, Snake River Plain Aquifer

August 2004

Prepared for the
U.S. Department of Energy
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ABSTRACT

This plan, along with the *Quality Assurance Project Plan for Waste Area Group 1, 2, 3, 4, 5, 6, 7, 10, and Deactivation, Decontamination, and Decommissioning*, DOE/ID-10587, comprise the Groundwater Monitoring Plan for the Operable Unit 3-13, Group 5, Snake River Plain Aquifer. The sampling and monitoring activities discussed include groundwater sampling and monitoring of groundwater elevations. The data are being collected to determine the effectiveness of the Operable Unit 3-13, Group 5, Snake River Plain Aquifer remedial action.

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ACRONYMS

COC	contaminant of concern
DEQ	Idaho Department of Environmental Quality
DOE	Department of Energy
DQO	data quality objective
EPA	Environmental Protection Agency
ESD	Explanation of Significant Differences
FTL	field team leader
HASP	Health and Safety Plan
ID	identification
INEEL	Idaho National Engineering and Environmental Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
LTMP	Long-Term Monitoring Plan
MRDS	Monitoring Report/Decision Summary
MSIP	Monitoring System and Installation Plan
OU	operable unit
QA	quality assurance
QAPjP	Quality Assurance Project Plan
QA/QC	quality assurance/quality control
RI/FS	remedial investigation/feasibility study
ROD	Record of Decision
SAM	Sample and Analysis Management
SAP	sampling and analysis plan
SRPA	Snake River Plain Aquifer
USGS	United States Geological Survey

Long-Term Monitoring Plan for Operable Unit 3-13, Group 5, Snake River Plain Aquifer

1. INTRODUCTION

The Idaho National Engineering and Environmental Laboratory (INEEL) is divided into 10 waste area groups to manage environmental operations mandated under the Federal Facility Agreement and Consent Order (DOE-ID 1991). The Idaho Nuclear Technology and Engineering Center (INTEC), formerly the Idaho Chemical Processing Plant, is designated as Waste Area Group 3. Operable Unit (OU) 3-13 encompasses the entire INTEC facility, except for the tank farm and groundwater inside the security fence.

The OU 3-13 was investigated to identify potential contaminant releases and exposure pathways to the environment from individual sites as well as the cumulative effects of related sites. Ninety-nine release sites were identified in the OU 3-13 Remedial Investigation/Feasibility Study (RI/FS), of which 46 were shown to have a potential risk to human health or the environment (DOE-ID 1997). The 46 sites were divided into seven groups based on similar media, contaminants of concern (COCs), accessibility, or geographic proximity. The OU 3-13 Record of Decision (ROD) (DOE-ID 1999) identifies remedial design/remedial action objectives for each of the seven groups. The seven groups are

Group 1	Tank Farm Soils
Group 2	Soils Under Buildings and Structures
Group 3	Other Surface Soils
Group 4	Perched Water
Group 5	Snake River Plain Aquifer
Group 6	Buried Gas Cylinders
Group 7	SFE-20 Hot Waste Tank System.

The final ROD for OU 3-13 was signed in October 1999 (DOE-ID 1999). This comprehensive ROD presents the selected remedial actions for the above groups and specifically provides for Group 5 groundwater monitoring to assess contaminant flux to the Snake River Plain Aquifer (SRPA) from within the INTEC facility. OU 3-14 was created to address contaminant sources at the INTEC tank farm, as well as groundwater inside the INTEC security fence. The Group 5 Monitoring Report/Decision Summary (MRDS) (DOE-ID 2004a) contains additional details regarding the groundwater remedy and remedial action objectives.

1.1 Purpose

The purpose of this Long-Term Monitoring Plan (LTMP) is to guide the collection and analysis of groundwater samples and data to support the Group 5 OU 3-13 SRPA monitoring at and downgradient of INTEC. Development of the LTMP was based on the data quality objectives (DQOs) found in the MRDS (DOE-ID 2004a) and additional monitoring requirements outlined in the Explanation of Significant Differences (ESD) to the OU 3-13 ROD (DOE-ID 2004b).

This LTMP, combined with the Quality Assurance Project Plan (QAPjP) (DOE-ID 2004c), form the sampling and analysis plan (SAP). These two documents are part of the Monitoring System and Installation Plan (MSIP) (DOE-ID 2002a), which is a Comprehensive Environmental Response, Compensation and Liability Act primary document that has served as the Remedial Design/ Remedial Action Work Plan. The LTMP has been revised as described in the MRDS (DOE-ID 2004a), a primary document which serves as the Remedial Action Report for OU 3-13, Group 5. As described in the MRDS, the LTMP constitutes the operations and maintenance plan for ongoing monitoring of the SRPA.

1.2 Scope

This LTMP provides the technical direction and methodology for routine groundwater sampling at INTEC. Data and monitoring results will be used to support remedial action decisions as detailed in the OU 3-13 Group 5 DQOs (DOE-ID 2004a).

The reader is referred to the OU 3-13 ROD for the remediation goals and remedial action objectives that have been established for the aquifer (DOE-ID 1999). The scope of this LTMP includes collection of data to determine if the existing remedy will be effective in meeting the remediation goals for the aquifer. As outlined in the DQOs specified in the MSIP (DOE-ID 2002a, Table 2-1), LTMP tasks include (1) long-term monitoring of the INTEC groundwater plume outside the INTEC fence line, (2) monitoring the COC flux migrating from INTEC to outside the INTEC fence, (3) evaluation of groundwater quality impacts from the former INTEC injection well, and (4) generation of data to update the OU 3-13 aquifer numerical model, which will be used to predict COC concentrations in the year 2095.

1.3 Regulatory Background

In October 1999, the ROD was issued for OU 3-13, which includes the INTEC perched and groundwater systems (DOE-ID 1999). The remedial actions chosen in the ROD are in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 as amended by the Superfund Amendments and Reauthorization Act of 1986. In addition, remedies comply with the National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR 300) and are intended to satisfy the requirements of the Federal Facility Agreement and Consent Order. The Department of Energy Idaho Operations Office is the lead Agency for remedy decisions. The Environmental Protection Agency (EPA) Region 10 and the Idaho Department of Environmental Quality (DEQ) approve these decisions.

Groundwater monitoring requirements to support the Group 5 remedy were subsequently reviewed and revised in the MRDS (DOE-ID 2004a) and the ESD (DOE-ID 2004b). Refer to these documents for details regarding the groundwater remedy and remedial action objectives. The OU 3-13 ROD (DOE-ID 1999) states that an interim action is selected for the SRPA. While the remediation of contaminated SRPA groundwater outside of the current INTEC security fence is final, the final remedy for the contaminated portion of the SRPA inside of the INTEC fence line is deferred to OU 3-14. As a result of dividing the SRPA groundwater contaminant plume associated with INTEC operations into two zones, the remedial action for OU 3-13 Group 5 is classified as an interim action.

It should be noted that update to the OU 3-13 flow and contaminant transport model will be performed as part of the OU 3-14 RI/FS. The modeling will include assessment of contaminant fluxes to the aquifer, as required by the OU 3-13 ROD, the OU 3-13 Group 5 MSIP (DOE-ID 2002a), and MRDS (DOE-ID 2004a). The requirements for periodic incorporation of new data and update of the Waste Area Group 3 OU 3-13 aquifer numerical model for prediction of COC concentrations in the SRPA at 2095 and beyond, scheduled for submittal in March 2005 under the OU 3-13 Group 5 MSIP, will be addressed in the OU 3-14 Remedial Investigation/Baseline Risk Assessment Report, as described in Sections 4.2 and 4.3 of the OU 3-14 RI/FS Work Plan (DOE-ID 2004d). The Remedial Investigation/Baseline Risk Assessment Report is due in March 2005 under the accelerated schedule and in August 2007 under the enforceable schedule.

2. SITE DESCRIPTION AND BACKGROUND

The location of the INTEC facility within the INEEL is shown on Figure 2-1. For background information and descriptions of the INEEL and INTEC, refer to the Group 5 MSIP (DOE-ID 2002a) and the MRDS (DOE-ID 2004a). These documents provide thorough discussions regarding the history, operational processes, hydrogeology, and groundwater conditions at INTEC.

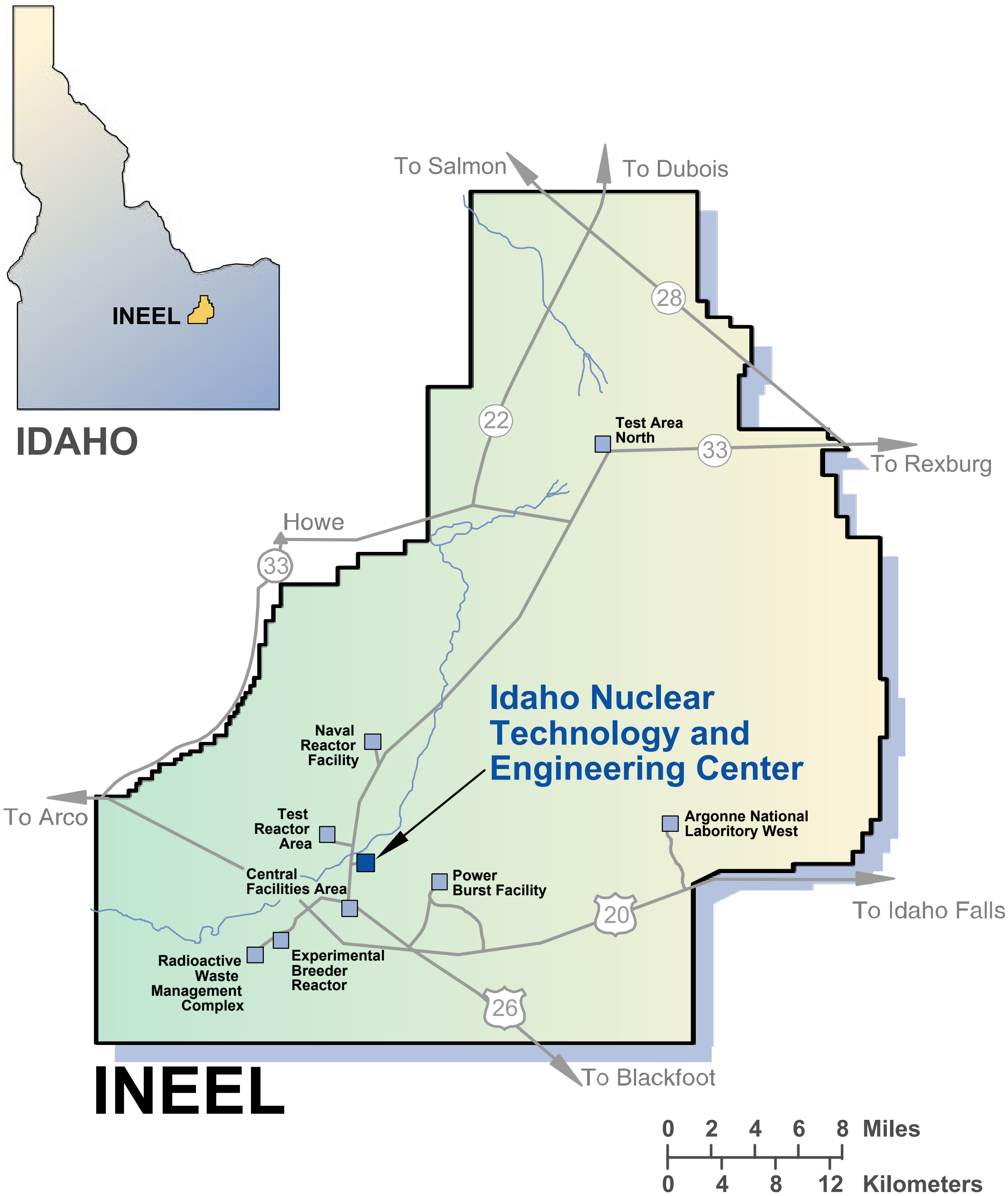

Figure 2-1. Map showing location of the INTEC at the INEEL.

3. GROUNDWATER SAMPLING AND MONITORING DATA QUALITY OBJECTIVES

The objective of this LTMP is to outline groundwater sample collection and monitoring activities to be conducted at and near INTEC. The groundwater monitoring will be performed to meet the SRPA monitoring requirements as stated in the OU 3-13 ROD (DOE-ID 1999). In general, the results from the monitoring will be used to

- Monitor the flux of contaminants in the aquifer across the INTEC security fence line and downgradient of the facility

- Validate and/or update the OU 3-13 aquifer numerical model

- Evaluate whether the INTEC groundwater plume in the SRPA outside of the INTEC fence line will meet the Group 5 remedial action objective of achieving Idaho groundwater quality standards or risk-based concentrations in the SRPA by 2095

- Monitor groundwater in the vicinity of the former INTEC injection well to assess impacts to groundwater quality.

The Group 5 MSIP (DOE-ID 2002a) and Group 5 MRDS (DOE-ID 2004a) are the governing documents for this LTMP. These primary documents discuss DQOs and the DQO process.

If future revisions are made to the Group 5 MSIP DQOs that affect or change the strategies/activities in the LTMP, this plan will be revised accordingly to meet the Group 5 MSIP DQOs.

3.1 Monitoring Objectives

The purpose of the groundwater monitoring is to obtain the data necessary to determine if the remediation goals for the aquifer will be met. The monitoring results will also be used to estimate contaminant fluxes across the INTEC security fence to the downgradient groundwater plume. COCs and remediation goals for the SRPA are shown in Table 3-1, along with the action levels for groundwater quality profiling established in the OU 3-13 ESD (DOE-ID 2004b).

Table 3-1. SRPA contaminant of concern remediation goals.

Contaminant of Concern	SRPA Remediation Goals (Maximum Contaminant Levels) For Single COCs[a]
Radionuclides	
Beta/gamma-emitting radionuclides	Total of beta/gamma-emitting radionuclides shall not exceed 4 mrem/yr effective dose equivalent
Sr-90 and daughters	8 pCi/L
Tritium	20,000 pCi/L
Tc-99 [b]	900 pCi/L
I-129[b,c]	1 pCi/L
Alpha-emitting radionuclides	15 pCi/L total alpha-emitting radionuclides
Uranium and daughters[d]	15 pCi/L
Np-237 and daughters[d]	15 pCi/L
Plutonium and daughters[d]	15 pCi/L
Am-241 and daughters[d]	15 pCi/L
Nonradionuclides	
Chromium	100 μg/L
Mercury	2 μg/L

a. If multiple contaminants are present, use a sum of the fractions to determine the combined COC remediation goals.

b. Derived maximum contaminant level is based on 4-mrem/yr effective dose equivalent.

c. In order to address concerns regarding groundwater quality impacts from the former INTEC injection well, the ESD (DOE-ID 2004b) to the OU 3-13 ROD established an I-129 action level of 5 pCi/L for depth-discrete groundwater samples collected with an inflatable straddle packer from Wells USGS-44, -46, and -47.

d. Sum of all alpha emitters, except as specified in 40 CFR 141.16.

3.2 Data Reporting

Data will be collected and validated per procedures identified in the QAPjP (DOE-ID 2004c). Data will be reported in the documents listed in Table 3-2.

Table 3-2. Groundwater monitoring reports

Report Type	Contents
Annual Well Monitoring Report	Groundwater chemistry Water-level trend data
Monitoring Report/Decision Summary (Submitted 1/04)	Groundwater chemistry Water-level trend data Recharge Contaminant flux to SRPA estimations Updated groundwater model

4. FIELD ACTIVITIES

The following sections describe the field activities and procedures to be used to meet the DQOs referenced in Section 3. Prior to commencing any sampling activities, a prejob briefing will be held with work-site personnel to review the requirements of the LTMP, Health and Safety Plan (HASP), and other work control documentation and to verify that supporting documentation has been completed. Additionally, following sampling, a postjob review will be conducted.

The OU 3-13 Group 5 groundwater monitoring and sampling will include collection of several types of data, including water levels, water samples, and geophysical logs of selected wells.

4.1 Sampling and Monitoring Well Network

Group 5 groundwater monitoring and sampling will include collection of several types of data, including water levels, water samples, and geophysical logs of selected wells. The samples will be collected from a network of existing groundwater wells. The first round of sampling in 2001 was a baseline sampling round that included nearly all groundwater monitoring wells in the vicinity of the INTEC facility and downgradient to the Central Facilities Area landfills (DOE-ID 2002b). Following this baseline sampling round, long-term monitoring activities include sampling of a selected subset of the INTEC monitoring wells.

4.1.1 Groundwater Sampling Locations

Groundwater monitoring wells that were included in the 2001 baseline sampling event are listed below and shown on Figure 4-1:

CFA-1	LF3-10	USGS-44	USGS-83
CFA-2	USGS-20	USGS-45	USGS-84
CFA-MON-A-001	USGS-34	USGS-46	USGS-85
CFA-MON-A-002	USGS-35	USGS-47	USGS-111
CFA-MON-A-003	USGS-36	USGS-48	USGS-112
ICPP-MON-A-021	USGS-37	USGS-51	USGS-113
ICPP-MON-A-022	USGS-38	USGS-52	USGS-114
LF2-08	USGS-39	USGS-57	USGS-115
LF2-09	USGS-40	USGS-59	USGS-116
LF2-10	USGS-41	USGS-67	USGS-121
LF2-11	USGS-42	USGS-77	USGS-123
LF3-08	USGS-43	USGS-82	USGS-127

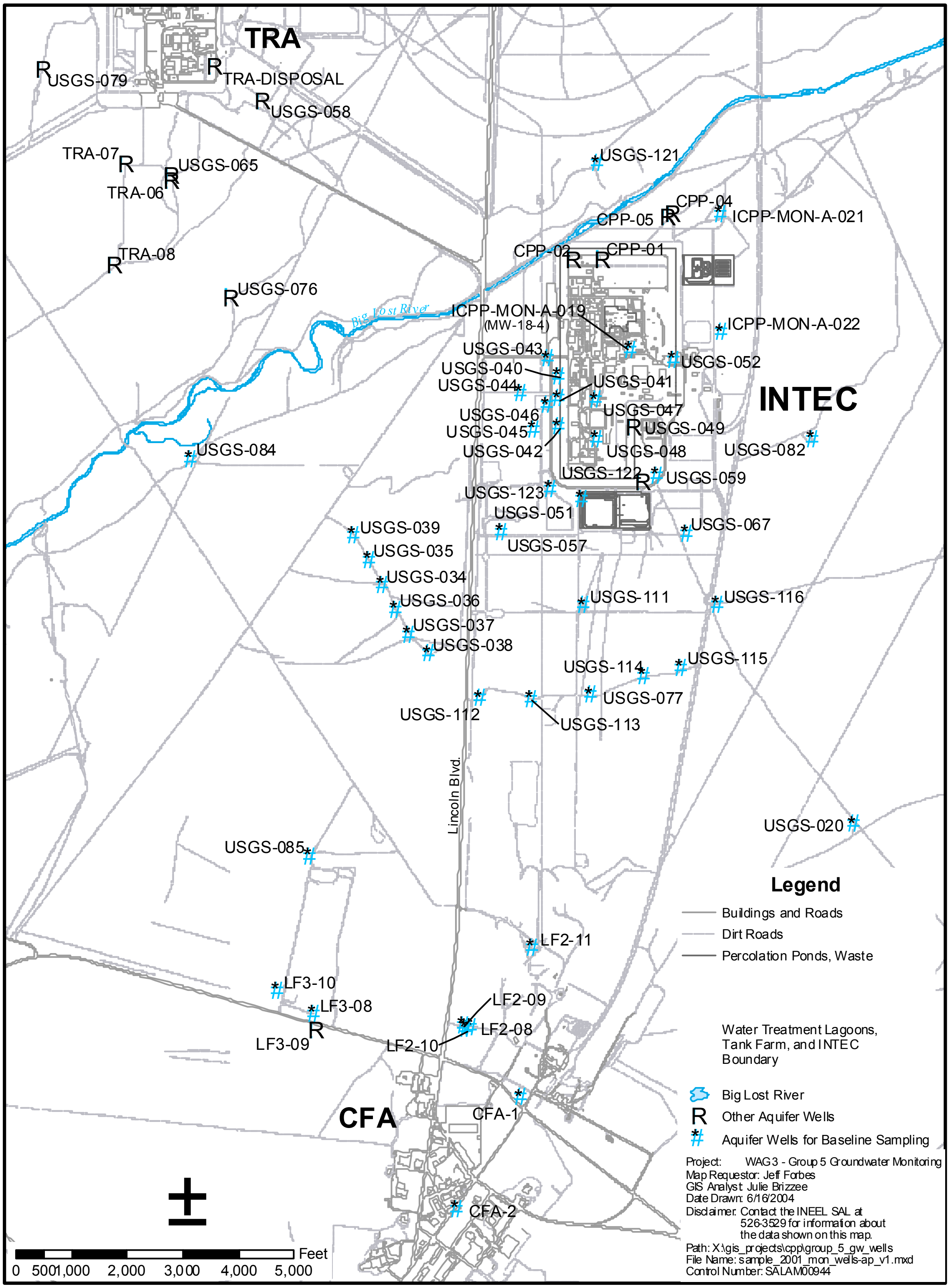

Figure 4-1. INTEC groundwater wells sampled during 2001 baseline sampling event.

Long-term monitoring wells are listed below and shown on Figure 4-2:

CPP-01	USGS-40	USGS-51	USGS-85
ICPP-MON-A-230	USGS-41	USGS-52	USGS-112
LF2-08	USGS-42	USGS-57	USGS-121
LF3-08	USGS-47	USGS-59	USGS-123
MW-18-4	USGS-48	USGS-67	

The following wells, which were included in the previous Group 5 LTMP (Revision 2), have been removed from the long-term monitoring program:

- USGS-49 (collapsed)
- USGS-122 (small-diameter well with no pump located close to USGS-59).

Monitoring wells to be sampled at discrete depths using an inflatable packer are listed in Table 4-1 and shown on Figure 4-3. Additional information regarding the packer sampling is provided in Section 5.4.

4.1.2 Groundwater-Level Monitoring Locations

With the exception of the production wells, existing INTEC area groundwater monitoring wells and several wells from surrounding areas will be included in the water-level monitoring network. The water-level information is essential for the determination of hydraulic gradients in the vicinity of the INTEC facility, to quantify the COC flux across the INTEC fence line, and to refine the site conceptual model and INTEC numerical model. The water-level information from the surrounding areas will serve to constrain the contouring of the water table along the edges of the area of interest. The wells for the water-level monitoring are listed below, with locations shown on Figure 4-4:

ICPP-MON-A-021	USGS-34	USGS-45	USGS-77
ICPP-MON-A-022	USGS-35	USGS-46	USGS-82
ICPP-MON-A-230	USGS-36	USGS-47	USGS-84
LF2-08	USGS-37	USGS-48	USGS-85
LF2-09	USGS-38	USGS-51	USGS-112
LF2-10	USGS-39	USGS-52	USGS-115
LF2-11	USGS-40	USGS-57	USGS-116
LF3-08	USGS-41	USGS-59	USGS-121
LF3-10	USGS-42	USGS-65	USGS-122
MW-18-4	USGS-43	USGS-67	USGS-123
USGS-20	USGS-44	USGS-76	

The following wells have been removed from the groundwater-level monitoring program:

- LF2-12 (LF2-10 nearby)
- LF3-09 (LF3-08 nearby)
- LF3-11 (abandoned; USGS-85 nearby)
- USGS-49 (collapsed; USGS-48 nearby)

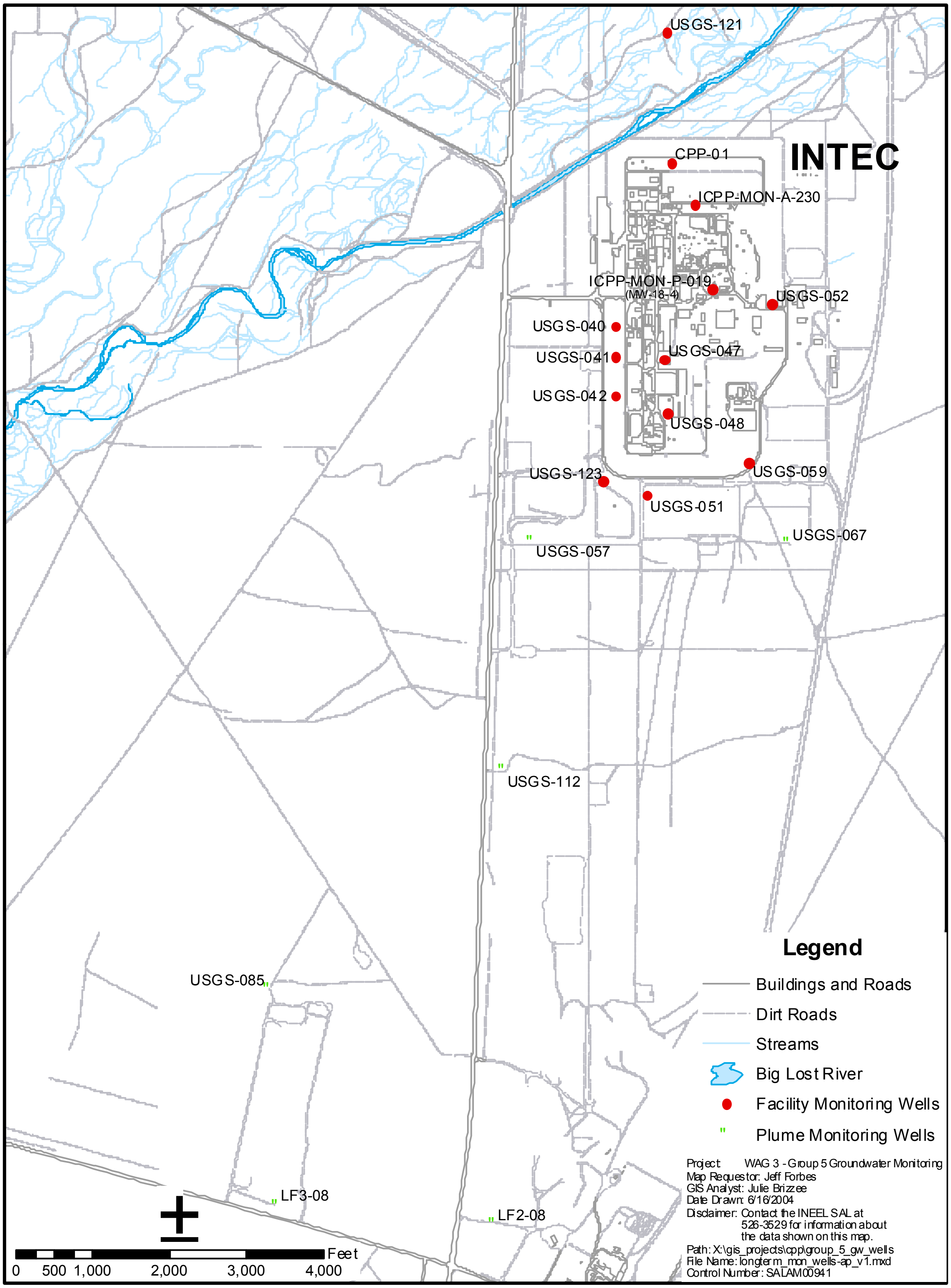

Figure 4-2. INTEC groundwater wells for long-term monitoring.

Table 4-1. Packer sampling schedule for INTEC wells.

	HI Interbed Wells[a]			ESD Vertical Profiling Wells[b]		
Year	USGS-41	USGS-48	USGS-59	USGS-44	USGS-46	USGS-47[d]
2003	**Packer[a]**	**Packer[a]**	**Packer[a]**	—[c]	—	**Conventional**
2004	**Conventional**	**Conventional**	**Conventional**	—	—	**Conventional**
2005	Packer[a] and conventional	Packer[a] and conventional	Packer[a] and conventional	Packer[b] and conventional	Packer[b] and conventional	Packer[b] and conventional
2006	—	—	—	—	—	Conventional
2007	Packer[a] and conventional	Packer[a] and conventional	Packer[a] and conventional	Packer[b] and conventional	Packer[b] and conventional	Packer[b-]and conventional
2009	—	—	—	—	—	Conventional
2010	Packer[a] and conventional	Packer[a] and conventional	Packer[a] and conventional	Packer[b] and conventional	Packer[b] and conventional	Packer[b] and conventional

Notes:

Packer sampling schedule above was agreed upon by the Department of Energy (DOE), EPA, and DEQ during April 2004, based on requirements in the ESD (DOE-ID 2004b). Based on the observed trends, a decision will be made in 2010 regarding the need for collection of additional groundwater samples using the inflatable packer in future years.

Bold text indicates sampling already completed as of June 2004.

Conventional sampling means purging and sampling the well using the dedicated submersible pump.

Packer sampling means placing an inflatable packer to collect a depth-discrete groundwater sample.

a. HI interbed wells are wells selected for groundwater sampling below the HI sedimentary interbed. Packer sampling in USGS-41, -48, and -59 is to be performed by placing an inflatable packer slightly below the HI interbed and collecting a single groundwater sample using the pump suspended below the packer. Beginning in 2005, a conventional sample will be collected before pulling the pump for the packer sampling.

b. ESD wells are wells identified in the ESD (DOE-ID 2004b) for vertical groundwater quality profiling. Groundwater quality profiling in USGS-44, -46, and –47 is to be performed beginning in 2005 using an inflatable straddle packer to collect groundwater samples from five depths spanning the open interval of the well. A conventional sample will be collected before pulling the pump for the straddle packer sampling.

c. "—" indicates no samples are to be collected from the well during that year.

d. Conventional sampling of this well is performed annually under the long-term monitoring schedule (Figure 4-2).

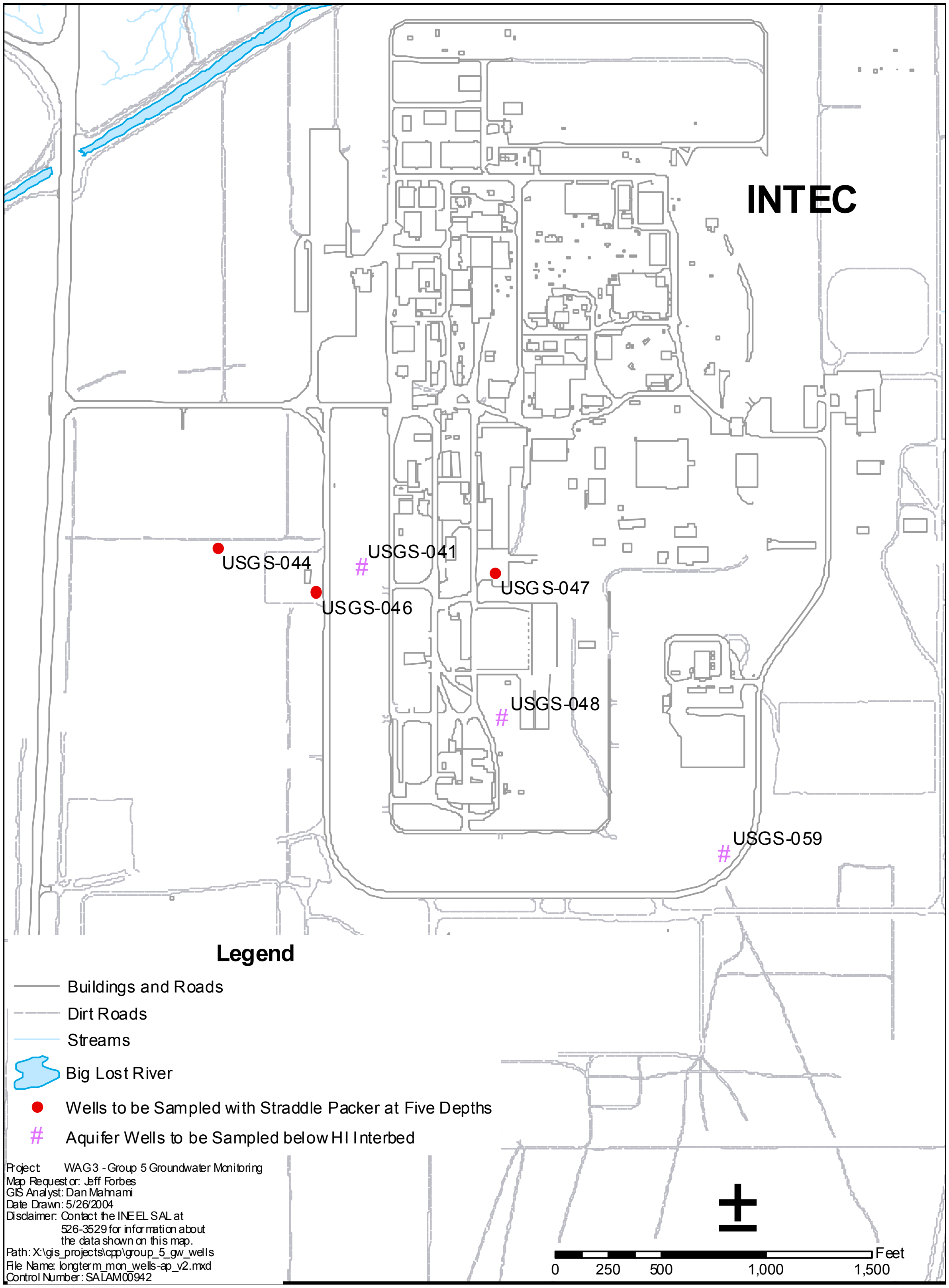

Figure 4-3. INTEC groundwater wells selected for depth-discrete packer sampling.

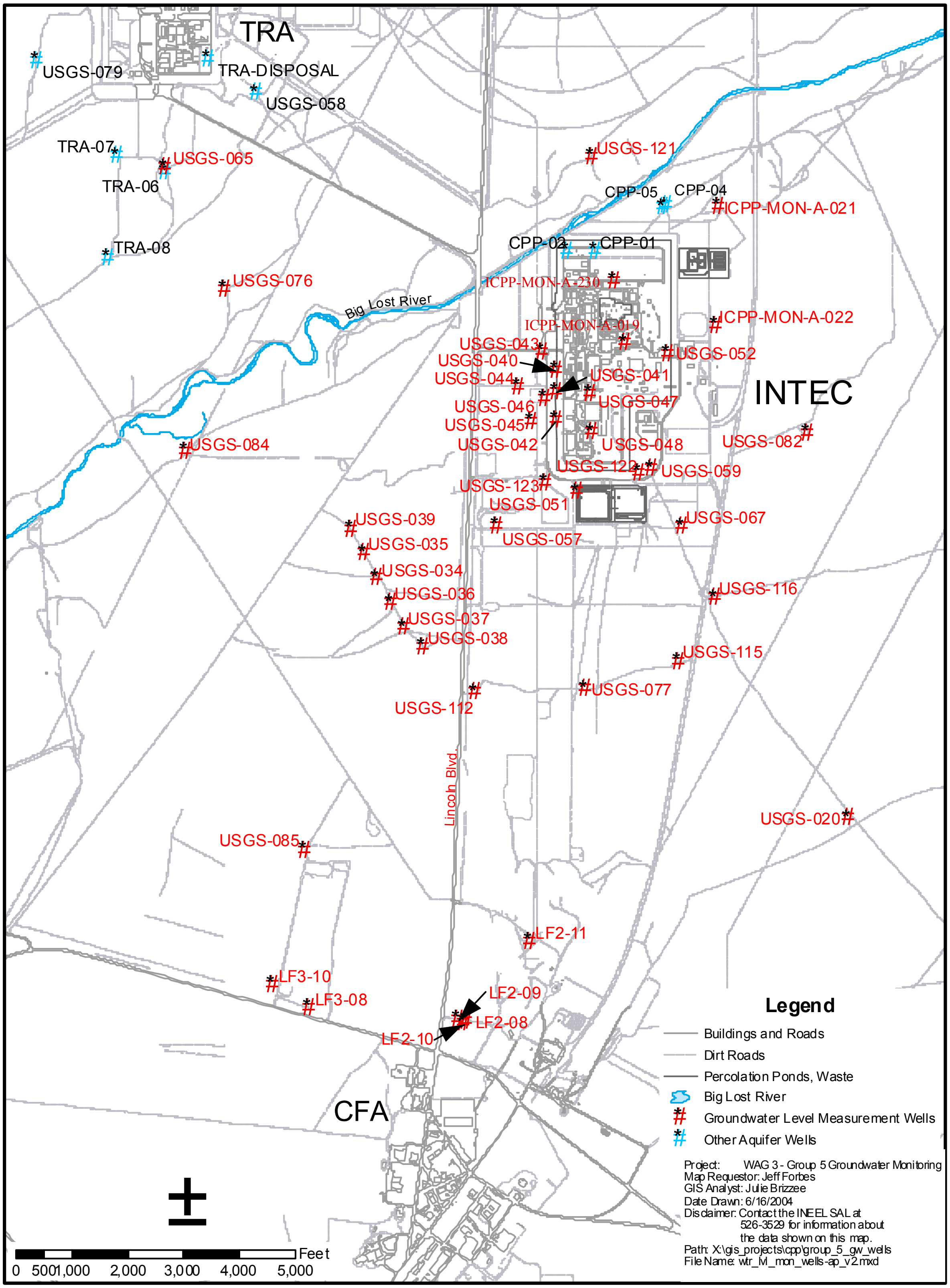

Figure 4-4. INTEC groundwater wells for water levels.

- USGS-111 (large deviation; USGS-77 nearby)
- USGS-113 (large deviation; USGS-112 nearby)
- USGS-114 (large deviation; USGS-115 nearby)
- TRA-08 (unnecessary; USGS-65 nearby).

In order to quantify vertical hydraulic gradients, wells that will be sampled using an inflatable packer will also have water-level measurements taken in the sample interval after conditions stabilize following installation of the packer (see Section 5.4).

4.2 Sampling and Monitoring Schedule

Table 4-2 lists the sampling and monitoring schedule for Group 5 monitoring under this LTMP. The Year 1 baseline monitoring event occurred in 2001.

4.3 Analyte List

Table 4-3 outlines the anticipated laboratory analytes for long-term groundwater monitoring. Laboratory analytes may be added or removed from this list if and when new technical information indicates the need to revise the suite of analytes. The QAPjP (DOE-ID 2004c) provides additional information regarding sample volumes, container types, preservatives, and maximum holding times.

Table 4-2. Long-term groundwater monitoring frequency.[a]

Sampling or Monitoring Activity	Frequency		
Groundwater sampling	Annual for years 2001 through 2007	Biennial beginning in year 2007 through 2015	Every 5 years beginning in year 2015 through 2095
Water-level measurements	Monthly for year 2001	Semiannual for years 2002 to 2005[b]	Annual for years 2006-2095[b]

a. See Section 4.1.1 for a list of long-term monitoring wells.

b. If snowpack should reach 120% of average snow water equivalent in the Big Lost River basin, more frequent water-level measurements will be made for a minimum of 1 year to monitor the effects of Big Lost River flow on groundwater levels. In this case, groundwater levels will be measured every month (at a minimum) in at least five SRPA monitor wells located between the Big Lost River and the southeastern portion of INTEC. Monthly measurements may be terminated in June of that year if it is apparent that flow will not occur in the Big Lost River near INTEC. The wells proposed for this monthly (or more frequent) water-level monitoring are ICPP-MON-A-230, MW-18-4, USGS-44, USGS-51, and USGS-52.

Table 4-3. Groundwater laboratory analytes.

COCs	Analytical Method[a]	Detection Limits (pCi/L)
Gross-alpha	Gas proportional counter (GPC)	2
Gross-beta	GPC	4
Tritium	Liquid scintillation counting (LSC)	400
Technetium-99	LSC or GPC	1
Iodine-129	Mass spectrometry, LSC, or gamma spectroscopy	0.1
Strontium-90	GPC	0.8
Plutonium isotopes (Pu-238, -239/240)	Alpha spectroscopy	0.05
Pu-241	LSC or GPC	0.05
Uranium isotopes (U-234, -235, and -238)	Alpha spectroscopy	0.05
Am-241	Alpha spectroscopy	0.05
Np-237	Alpha spectroscopy	0.05
Cs-137	Gamma spectroscopy	3
Mercury	SW-846 Method 7470A[b]	0.2 µg/L

Note: Field parameters to be measured at all locations include pH, temperature, and electrical conductivity.

a. Methods used for radionuclide analysis are laboratory-specific and are referenced to nationally accepted sources such as EPA methods, DOE Methods Compendium, DOE Environmental Measurements Laboratory HASL 300 methods, etc.

b. EPA, 1994, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, 3rd Edition, “Mercury in Liquid Waste (Manual Cold-Vapor Technique),” Method 7470A, Rev. 1, U.S. Environmental Protection Agency.

5. SAMPLING AND MONITORING PROCEDURES AND EQUIPMENT

This section describes the sampling and monitoring procedures and equipment to be used for the planned groundwater monitoring. Prior to any sampling activities, a presampling meeting will be held to review the requirements of the LTMP and HASP and to ensure supporting documentation has been completed.

5.1 Groundwater Elevations

Prior to sampling, groundwater elevations will be measured using either an electronic measuring tape (Solinst brand or equivalent) or a steel tape measure. Measurement of groundwater levels will be recorded to the nearest 0.01 ft.

5.2 Well Purging

Monitoring wells will be purged prior to sample collection. During the purging operation, a Hydrolab (or equivalent) will be used to measure specific conductance, pH, and temperature. A sample for water quality analysis can be collected after a minimum of three well casing volumes of water have been purged from the well and when three consecutive water quality parameters are within the following limits:

pH	$\pm$ 0.1
Temperature	$\pm$ 0.5°C
Specific conductance	$\pm$ 10 μmhos/cm.

5.3 Groundwater Sampling

Prior to sampling, nondedicated sampling equipment that comes in contact with the water sample will be cleaned. Following sampling, nondedicated equipment that came in contact with the groundwater will be decontaminated prior to storage.

Prior to purging, the water level in each well will be measured. The well will then be purged a minimum of three well casing volumes until the pH, temperature, and specific conductance of the purge water have stabilized, or until a maximum of five well casing volumes have been removed. A flow-through cell will be used to collect water quality measurements. If the well goes dry prior to purging three well bore volumes, purging will be considered complete and samples collected no later than the end of the next business day following purging. If field water-quality parameters are still not stable after five volumes have been purged, samples will be collected and appropriate notations will be recorded in the logbook.

Sample bottles for groundwater samples will be filled to approximately 90 to 95% of capacity to allow for content expansion or preservation. Samples requiring acidification will be acidified to a pH <2 using ultra-pure nitric acid. The following is the preferred order for sample collection:

1. Temperature, pH, specific conductance (during purging)
2. Radionuclides (unfiltered)
3. Mercury (unfiltered).

5.4 Depth-Discrete Groundwater Sampling Using Inflatable Packer

Two sets of wells have been selected for sampling using an inflatable packer. The first set consists of three monitoring wells (USGS-41, -48, and –59) selected for groundwater sampling beneath the HI interbed to assess the presence of I-129 and other COCs in groundwater, as required by the Group 5 MSIP (DOE-ID 2002a). These three wells are referred to below as the "HI Interbed Wells." A second set of three monitoring wells was identified in the ESD to the OU 3-13 ROD (DOE-ID 2004b). In addition to the sampling requirements in the ROD (DOE-ID 1999), the ESD requires periodic groundwater quality profiling at five discrete depths in these three monitoring wells (USGS-44, -46, and -47) to monitor concentrations of I-129 in the aquifer resulting from the former INTEC injection well (CPP-23). This second set of wells is referred to below as the "ESD Wells." Sampling procedures using the inflatable packer are described below. Table 4-1 shows the schedule for collection of depth-discrete groundwater samples using an inflatable packer.

5.4.1 Packer Sampling Procedures for HI Interbed Wells

The monitoring wells specified for groundwater sampling below the HI interbed include USGS-41, USGS-48, and USGS-59. Each of these wells is completed as an open hole below the water table. Table 5-1 shows the open hole interval, depth of the HI interbed, and target packer placement depth for each of the three HI interbed wells. Actual depths of packer placement may be revised based on borehole conditions observed on the videolog.

At each well, the existing dedicated pump, power cable, and column pipe will be removed from the well by the subcontractor. This equipment will be stored aboveground on plastic and covered with plastic. A videolog will then be run in the open hole interval to determine the condition of the borehole wall and to ensure that no bridging or blockage of the hole exists to the depth targeted for packer insertion. The depth to water and the total depth of the well shall be noted in the field logbook.

The packer and sampling pump will be assembled on the ground surface on plastic. The right-hand configuration in Figure 5-1 shows the packer assembly to be used for groundwater sampling below the HI interbed. The pump shall have the check valve (if any) removed, or, alternatively, a small weep hole installed at the bottom of the column pipe, to permit water-level measurement using an electronic water

Table 5-1. Depth of HI interbed and target packer placement depths.

Well ID	Open Hole Interval (ft bgs)[a]	Depth of HI Interbed (ft bgs)[b]	Target Packer Placement Depth (ft bgs)[c]	Target Sample Interval (ft bgs)[c]	Estimated Purge Volume (gal)[d]
USGS-041	428-673	550-554	554-555	555-673	525
USGS-048	462-743	550-553	557-558	558-743	825
USGS-059	464-657	554-555	555-556	556-657	450

a. Well construction details from United States Geological Survey (USGS) well completion diagrams. All open boreholes are 6-in.-diameter.

b. HI interbed depth from downhole videologs run on July 28, 2003.

c. Packer placement depths and sample intervals from July-August 2003 packer sampling event.

d. Purge volume calculated as three times the volume of water within the sample interval.

bgs = below ground surface.

Figure 5-1. Packer and pump configurations.

level sounder inserted down the column pipe. In addition, this arrangement will have the benefit of allowing water to drain back down the column pipe following sampling. The packer and pump assembly will then be inserted into the well and installed to the target packer depths shown in Table 5-1. Based on review of the downhole videolog, the field team leader (FTL) may slightly alter the target packer depths to ensure a good seal against the borehole wall.

The inflatable packer will be inflated to create a seal against the borehole wall. The hydraulic head within the sample interval will then be determined by measuring the depth to water below the packer. Because inflation of the packer could cause a temporary rise in hydraulic head, the depth to water should be measured again 5 minutes following the first measurement. If the two measurements agree within ±0.01 ft, then the water level in the sample interval is assumed to have stabilized. If the measurements indicate that the water level is changing, wait 5 minutes and repeat the measurement until the water level has stabilized.

After the water level has stabilized, begin purging the sample interval using the submersible pump. Three times the volume of the water column within the sample interval shall be purged prior to collection of groundwater samples. Estimated purge volumes are shown in Table 5-1. As described in Section 5.1, field parameters shall be monitored during purging. Following purging of three sample interval volumes and stabilization of field parameters, groundwater samples will be collected. Analytical parameters shall consist of the same suite as that specified for routine groundwater sampling (Table 4-3).

5.4.2 Straddle Packer Sampling Procedures for ESD Wells

An ESD to the OU 3-13 ROD (DOE-ID 2004b) was issued in January 2004. Among the requirements of the ESD was the performance of vertical water quality profiling in three existing aquifer monitor wells (USGS-44, -46, and –47) located downgradient of the former INTEC injection well (Figure 4-3). The ESD further required that vertical profiling be performed "every 5 years to monitor concentrations of I-129 in the aquifer resulting from the former injection well. Vertical profiling will be performed using a straddle packer sampling system at a minimum of five discrete depths in each well." Following the publication of the ESD, the DOE, DEQ, and EPA reached an agreement to coordinate the packer sampling schedules for the HI interbed wells (Section 5.4.1) and the packer sampling required by the ESD. This agreement was intended to coordinate the packer sampling events to reduce costs and maximize data comparability. Table 4-1 shows the schedule for packer sampling of the six wells that was agreed upon by the Agencies.

The monitoring wells specified by the ESD for groundwater profiling at five depths include USGS-44, USGS-46, and USGS-47. Each of these wells is completed as an open hole below the water table. Vertical water quality profiling was performed previously during 1992-93 in two of these wells (USGS-44 and USGS-46) (McCurry and Welhan 1996). Table 5-2 shows the open hole interval, and target packer placement depths for each of the three ESD wells. Actual depths of packer placement may be revised based on borehole conditions observed on the videolog.

At each well, the existing dedicated pump, power cable, and column pipe will be removed from the well by the subcontractor. This equipment will be stored aboveground on plastic and covered with plastic. A videolog will then be run in the open hole interval to determine the condition of the borehole wall and to ensure that no bridging or blockage of the hole exists to the depth targeted for packer insertion. The depth to water and the total depth of the well will be noted in the field logbook.

The middle configuration in Figure 5-1 shows the packer assembly to be used for groundwater profiling in the ESD monitor wells. Aside from the difference in the packer configuration, procedures for

Table 5-2. Target packer placement depths and sampling intervals for ESD wells.

Well ID	Open Hole Interval (ft bgs)[a]	Target Packer Depths (ft bgs)		Target Sample Intervals (ft bgs)[b]	Estimated Purge Volume (gal)[c]
		Top	Bottom		
USGS-044	461-650	466-467	487-488	467-487	90
		494-495	515-516	495-515	90
		518-519	539-540	519-539	90
		534-535	555-556	535-555	90
		579-580	600-601	580-600	90
USGS-046	461-650	463-464	482-483	464-482	80
		487-488	506-507	488-506	80
		506-507	549-550	507-549	80
		552-553	571-572	553-571	80
		611-612	630-631	612-630	80
USGS-047	458-651	464-465	485-486	465-485	90
		494-495	515-516	495-515	90
		529-530	550-551	530-550	90
		569-570	590-591	570-590	90
		609-610	630-631	610-630	90

a. Well construction details from USGS well completion diagrams. All open boreholes are 6-in.-diameter.

b. Target sample intervals based on depth zones sampled by McCurry and Welhan (1996). Actual sample intervals and packer placement depths will be determined based on downhole videologs.

c. Purge volume calculated as three times the volume of water within the sample interval.

bgs = below ground surface.

placement of the packer assembly and depth-discrete groundwater sampling will be similar to those described in Section 5.4.1. The packer and pump assembly will be installed to the target packer depths shown in Table 5-2. Based on review of the downhole videolog, the FTL may slightly alter the target packer depths in order to ensure a good seal against the borehole wall. The hydraulic head within the isolated interval between the two packers will be determined by measuring the depth to water in the pump discharge pipe (Figure 5-1).

Following purging of three sample interval volumes and stabilization of field parameters, groundwater samples will be collected. Analytical parameters shall consist of the same suite as that specified for routine groundwater sampling (Table 4-3).

5.5 Personal Protective Equipment

The personal protective equipment required for this sampling effort is discussed in the project HASP.

6. SAMPLE CONTROL

Strict sample control is required on this project. Sample control ensures that unique sample identifiers are used for each sample. It also ensures that documentation of sample collection information is such that a sampling event may be reconstructed at a later date.

The INEEL Sampling and Analysis Management (SAM) Group will use a systematic character identification (ID) code to uniquely identify the samples. A SAP table/database will be generated for each sampling event to record pertinent information associated with each sample ID code (e.g., well designation, sample medium, date). The QAPjP (DOE-ID 2004c) outlines the requirements and procedures for sample handling, chain-of-custody, sample preservation, sample packaging, radiological screening of samples, and shipment of samples to the laboratory.

7. QUALITY ASSURANCE/QUALITY CONTROL

The QAPjP (DOE-ID 2004c) provides an extensive discussion about the quality assurance/quality control (QA/QC) protocols used to achieve project data quality objectives. This section details the field elements of the QAPjP to support field operations during groundwater sampling and monitoring activities.

7.1 Project Data Quality Objectives

The quality assurance (QA) objectives specify the measurements that must be met to produce acceptable data for a project. The technical and statistical qualities of these measurements must be properly documented. Precision, accuracy, and completeness are quantitative parameters that must be specified for physical/chemical measurements. Comparability and representativeness are qualitative parameters.

The QA objectives for this project will be met through a combination of field and laboratory checks. Field checks will consist of collecting field duplicates, equipment blanks, and field blanks. Minimum frequencies for QA/QC sample collection are specified in the QAPjP (DOE-ID 2004c). Laboratory checks consist of initial and continuing calibration samples, laboratory control samples, matrix spikes, and matrix spike duplicates. Laboratory QA is detailed in the QAPjP (DOE-ID 2004c) and is beyond the scope of this LTMP.

7.1.1 Field Precision

Field precision is a measure of the variability not due to laboratory or analytical methods. The three types of field variability or heterogeneity are spatially within a data population, between individual samples, and within an individual sample. Although the heterogeneity between and within samples can be evaluated using duplicate and/or sample splits, overall field precision will be calculated as the relative percent difference between two measurements or relative standard deviation between three or more measurements. The relative percent difference or relative standard deviation will be calculated as indicated in the QAPjP, for duplicate samples, during the data validation process. Duplicate samples to assess precision will be collected at a minimum frequency of one duplicate per 20 samples.

7.1.2 Field Accuracy

Cross-contamination of samples during collection or shipping could yield incorrect analytical results. To assess the occurrence of any cross-contamination events, field blanks and equipment rinsate samples will be collected to evaluate any potential impacts. Accuracy of field instrumentation will be maintained by calibrating instruments used to collect data and cross-checking with other independently collected data.

7.1.3 Representativeness

Representativeness is evaluated by assessing the accuracy and precision of the sampling program and expressing the degree to which samples represent actual site conditions. In essence, representativeness is a qualitative parameter that addresses whether the sampling program was properly designed to meet the DQOs. The representativeness criterion is best satisfied by confirming that sampling locations are selected properly and a sufficient number of samples are collected to meet the requirements stated in the DQOs.

7.1.4 Comparability

Comparability is a qualitative measure of the confidence with which one data set can be compared to another. These data sets include data generated by different laboratories performing this work, data generated by laboratories in previous studies, data generated by the same laboratory over a period of several years, or data obtained using different sampling techniques or analytical protocols. For field aspects of this program, data comparability will be achieved using standard methods of sample collection and handling. Data collection frequency and long-term trends will ensure comparability of monitoring data.

7.1.5 Completeness

Field completeness will be assessed by comparing the number of samples collected to the number of samples planned. Field sampling completeness is affected by such factors as equipment and instrument malfunctions and insufficient sample recovery. Completeness can be assessed following data validation and reduction. The completeness goal for this project is 100% for critical activities and 90% for noncritical activities. The completion of an annual groundwater sampling event is considered a critical activity, while the collection of individual samples is not critical.

7.2 Field Data Reduction

The reduction of field data is important to ensure that there have been no errors in sample labeling and documentation. This includes cross-referencing the SAP tables with sample labels, logbooks, and chain-of-custody forms. Prior to sample shipment to the laboratory, field personnel will ensure that field information is properly documented.

7.3 Data Validation

Laboratory-generated data will be validated to Level B, as outlined in the QAPjP (DOE-ID 2004c). Field-generated data (e.g., water levels, field parameters) will be validated through the use of properly calibrated instrumentation, comparing and cross-checking data with independently gathered data, and recording data collection activities in a bound field logbook.

8. DATA MANAGEMENT/DATA ANALYSIS AND UNUSUAL OCCURRENCES

8.1 Data Management and Analysis

Analytical data that result from groundwater sampling will be managed and maintained by the SAM Program and the Environmental Data Warehouse in accordance with the Data Management Plan for OU 3-13 (DOE-ID 2000). Water-level data will be maintained by the project and published in the annual groundwater monitoring reports. The Hydrogeologic Data Repository will provide long-term management of the field data, and the INEEL Electronic Document Management System will serve as a library of published documents, such as annual groundwater monitoring reports.

8.2 Unusual Occurrences

Unusual occurrences are situations that are unforeseen, unanticipated, or unexpected. They may occur in chemical data sets or as field-related data and observations. An example of an unusual occurrence is detection of a COC where previously it was undetected.

The following is meant to provide a process for resolving an unusual occurrence rather than a method for dealing with each specific unusual occurrence. The following steps will be taken to resolve an unusual occurrence:

- Record the unusual occurrence and supporting observations in the field logbook.
- Validate (confirm) the unusual occurrence (e.g., reanalyze the sample if any remaining) and report to the project manager as soon as possible.
- Determine if the occurrence is a one-time event or is recurring.
- If the unusual occurrence is of a significant nature (significant is anything that can potentially increase contaminant flux to the aquifer with concentration levels above maximum contaminant levels, e.g., large persistent increases in water levels), it will be reported to the appropriate project managers.
- If the unusual occurrence is not of a significant nature (e.g., malfunctioning instrument that is reporting increases in water levels), it will be resolved by the technical leader.
- Take appropriate action for significant unusual occurrences, which may include increasing sampling and/or monitoring frequency, resampling of wells, or reviewing the ROD for implementation of a remedial action.

9. PROJECT ORGANIZATION AND RESPONSIBILITIES

The organization structure for this project reflects the resources and expertise required to perform the work, while minimizing the risks to worker health and safety. The HASP (INEEL 2003) outlines the responsibilities of key project and work-site personnel.

10. WASTE MANAGEMENT

Waste will be managed in accordance with the Waste Management Plan (DOE-ID 2003). Waste generated during the OU 3-13, Group 5, groundwater sampling may include the following:

- Contaminated personal protective equipment, wipes, bags, and other refuse
- Contaminated sampling equipment
- Purge water
- Used sample containers and disposable sampling equipment.

11. HEALTH AND SAFETY

Work performed for the Group 5 LTMP will be performed in accordance with the project HASP (INEEL 2003). The HASP meets the requirements of 29 CFR 1910.120 and 29 CFR 1926.65, "Hazardous waste operations and emergency response."

12. DOCUMENT MANAGEMENT

This section summarizes document management and sample control. Documentation includes field logbooks used to record field data and sampling procedures, chain-of-custody forms, and sample container labels. The analytical results from this field investigation will be documented in the OU 3-13 Group 5 Annual Well Monitoring Reports.

12.1 Documentation

The FTL will be responsible for controlling and maintaining field documents and records and for verifying that all required documents to be submitted to the INEEL SAM are maintained in good condition. Entries will be made in indelible black ink. Errors will be corrected by drawing a single line through the error and entering the correct information. All corrections will be initialed and dated.

12.1.1 Sample Container Labels

Waterproof, adhesive labels generated from the SAP database will display information such as the unique sample identification number, the name of the project, sample location, and analysis type. Labels will be completed and placed on the containers in the field before collecting the sample. Sample team members will provide information necessary for label completion. Such information may include sample date, time, preservative used, field measurements of hazards, and the sampler's initials.

12.1.2 Field Guidance Form

Field guidance forms, provided for each sample location, will be generated from the SAP database, to ensure unique sample numbers. These forms are used to facilitate sample container documentation and organization of field activities and contain information regarding the following:

- Media
- Sample ID numbers
- Sample location
- Aliquot ID
- Analysis type
- Container size and type
- Sample preservation.

12.1.3 Field Logbooks

In accordance with INEEL SAM format, field logbooks will be used to record information necessary to interpret the analytical data in accordance with the SAM Program’s required format. Field logbooks will be controlled and managed according to applicable company policies and procedures.

12.1.3.1 Field Team Leader's Daily Logbook. A project logbook maintained by the FTL will contain a daily summary of the following:

- Field team activities
- Visitor log
- List of site contacts
- Problems encountered
- Any corrective actions taken as a result of field audits.

This logbook will be signed and dated at the end of each day's sampling activities.

12.1.3.2 Sample Logbooks. Sample logbooks will be used by the field teams. Each sample logbook will contain information such as the following:

- Physical measurements (if applicable)
- Quality control samples
- Sample information (e.g., sample location, sample matrix, analyses requested)
- Shipping information (e.g., collection dates, shipping dates, cooler ID number, destination, chain-of-custody number, name of shipper)
- Team activities
- Problems encountered
- Visitor log
- List of site contacts.

This logbook will be signed and dated at the end of each day’s sampling activities.

12.1.3.3 Field Instruments Operation and Maintenance. The FTL logbook may be used to record calibration data for equipment requiring periodic calibration or standardization.

12.1.4 Photographs

Photographs may be taken by field personnel to record monitoring activities and wellhead details. When photographs are taken, one copy will be placed in the project file, and a second copy will accompany other project documents (e.g., field logbooks) to be placed in the Document Control and Records Management files.

13. REFERENCES

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Appendix A

INTEC Area Aquifer Well Construction Summary

INTEC Area Aquifer Well Construction Summary Table

INEEL Name	Alias	Year Installed	Surface Elevation (feet)	Total Depth (feet	Borehole Diameter Depth – top (feet)	Depth – bottom (feet)	Diameter (in)	Screen Information Depth – top (feet)	Depth – bottom (feet)	Diameter (in)	Screen Type[a]
CPP-1	CPP-1	1950	4913.2	586	0.0	585.5	20.0	459.9	485.9	16.0	PS
								527.4	576.8	16.0	PS
CPP-2	CPP-2	1951	4915.4	605	0.0	605.3	24.0	458.30	483.30	16.0	PS
								551.10	600.25	16.0	PS
CPP-3	Injection Well	1950	4914.1	598	0.0	598.0	24.0	412.00	452.00	16.0	PS
	(Plugged 1989)							490.00	593.00	16.0	PS
CPP-4	CPP-4	1983	4907.4	700	0.0	50.0	30.0	450.00	700.00	12.0	PS
					50.0	130.0	24.0				
					130.0	450.0	20.0				
					450.0	700.0	16.0				
CPP-5	CPP-5	1991	4910.0	725	0.0	85.0	28.0				
					85.0	725.0	20.0	610.00	725.00	12.0	PS
ICPP-MON-A-021	ICPP-MON-A-021	1995	4904.0	486	0.0	22.0	22.0	450.50	480.50	5.0	SS
					22.0	27.5	17.5				
					27.5	485.5	9.8				
ICPP-MON-A-022	ICPP-MON-A-022	1995	4907.0	585	0.0	510.0		490.00	510.00	5.0	SS
LF2-08	LF2-08	1988	4931.7	526	0.0	526.0	12.0	483.50	495.00	6.0	SS
LF2-09	LF2-09	1988	4932.2	676	0.0	676.0	10.0	469.60	497.00	4.0	SS
LF2-10	LF2-10	1988	4932.5	816	0.0	627.0	12.0	725.00	735.00	6.0	PSS
								745.00	755.00	6.0	PSS
					627.0	820.0	8.0	755.00	765.00	6.0	SS
LF2-11	LF2-11	1989	4928.4	511	0.0	510.9	10.0	466.00	499.00	4.0	SS
LF3-08	LF3-08	1988	4940.2	525	0.0	525.0	12.0	500.00	510.00	6.0	SS
LF3-09	LF3-09	1990	4941.1	517				480.00	500.00	4.5	SS
LF3-10	LF3-10	1990	4942.6	530				481.00	501.00	4.26	SS
LF3-11	LF3-11	1990	4934.1	532				472.20	492.20	4.5	SS
USGS-20	USGS-20	1951	4915.9		0.0	404.0	12.0	471.17	480.98	6.3	PS
				676	404.0	676.0	8.0	511.82	552.73	6.3	PS

INEEL Name	Alias	Year Installed	Surface Elevation (feet)	Total Depth (feet	Borehole Diameter			Screen Information			Screen Type[a]
					Depth – top (feet)	Depth – bottom (feet)	Diameter (in)	Depth – top (feet)	Depth – bottom (feet)	Diameter (in)	
USGS-34	USGS-34	1954	4929.7	700	0.0	363.0	16.0	499.00	700.00	8.0	OH
					363.0	499.0	13.0				
					499.0	700.0	10.0				
USGS-35	USGS-35	1955	4930.1	578.5	0.0	39.0	>12	142.50	578.50	7.0	OH
					39.0	144.5	10.0				
					144.5	578.5	7.0				
USGS-36	USGS-36	1955	4929.9	567.1	0.0	37.0	12.0	431.70	567.10	6.0	OH
					37.0	394.7	8.0				
					394.7	567.1	6.0				
USGS-37	USGS-37	1955	4929.6	573	0.0	41.5	12.0	507.00	571.50	6.0	OH
					41.5	197.0	10.0				
					197.0	507.0	8.0				
					507.0	573.0	6.0				
USGS-38	USGS-38	1955	4930.0	729	0.0	26.0	12.0	678.00	729.00	4.0	OH
					26.0	156.0	10.0				
					156.0	505.0	8.0				
					505.0	729.0	6.0				
USGS-39	USGS-39	1955	4932.9	572	0.0	48.0	12.0	507	571.89	6.0	OH
					48.0	152.0	10.0				
					152.0	507.0	8.0				
					507.0	572.0	6.0				
USGS-40	USGS-40	1956	4916.0	678.8	0.0	220.0	11.5	452	678.80	4.0	PS
					220.0	447.0	8.0				
					447.0	678.8	6.0				
USGS-41	USGS-41	1956	4917.1	674.4	0.0	428.1	8.0	428.09	674.40	6.0	OH
					428.1	674.4	6.0				
USGS-42	USGS-42	1957	4917.9	678.45	0.0	34.0	12.0	452.52	678.45	6.0	OH
					34.0	452.5	10.0				
					452.5	678.5	6.0				

INEEL Name	Alias	Year Installed	Surface Elevation (feet)	Total Depth (feet	Borehole Diameter Depth – top (feet)	Borehole Diameter Depth – bottom (feet)	Borehole Diameter Diameter (in)	Screen Information Depth – top (feet)	Screen Information Depth – bottom (feet)	Screen Information Diameter (in)	Screen Type[a]
USGS-43	USGS-43	1957	4916.3	675.8	0.0	54.0	12.0	450.54	675.80	6.0	OH
					54.0	450.5	10.0				
					450.5	675.8	6.0				
USGS-44	USGS-44	1957	4918.6	650	0.0	35.0	12.0	461.00	650.00	6.0	OH
					35.0	385.0	10.0				
					385.0	461.0	8.0				
					461.0	650.0	6.0				
USGS-45	USGS-45	1957	4919.6	651.21	0.0	53.0	12.0	461.00	651.51	6.0	OH
					53.0	133.0	10.0				
					133.0	461.0	8.0				
					461.0	651.2	6.0				
USGS-46	USGS-46	1958	4917.3	650.86	0.0	45.0	12.0	461.33	650.86	6.0	OH
					45.0	268.0	10.0				
					268.0	461.3	8.0				
					461.3	650.9	6.0				
USGS-47	USGS-47	1958	4915.6	651.3	0.0	41.0	12.0	458.14	651.30	6.0	OH
					41.0	460.0	8.0				
					460.0	651.3	6.0				
USGS-48	USGS-48	1958	4917.1	750	0.0	32.0	12.0	462.10	750.00	6.0	OH
					32.0	462.1	8.0				
					462.1	750.0	6.0				
USGS-49	USGS-49	1960	4912.9	656	0.0	129.0	16.0	458.29	656.00	6.0	OH
					129.0	458.0	8.0				
					458.0	656.0	6.0				
USGS-51	USGS-51	1960	4918.1	659	0.0	68.0	12.0	475.20	659.00	6.0	OH
					68.0	475.2	8.0				
					475.2	659.0	6.0				
USGS-52	USGS-52	1959	4910.5	650	0.0	248.0	16.0	450.00	650.00	6.0	OH
					248.0	264.0	12.0				
					264.0	450.0	10.0				
					450.0	650.0	6.0				

INEEL Name	Alias	Year Installed	Surface Elevation (feet)	Total Depth (feet	Borehole Diameter			Screen Information			Screen Type[a]
					Depth – top (feet)	Depth – bottom (feet)	Diameter (in)	Depth – top (feet)	Depth – bottom (feet)	Diameter (in)	
USGS-57	USGS-57	1960	4923.3	732	0.0	52.0	12.0	474.00	732.00	6.0	OH
					52.0	465.0	10.0				
					465.0	732.0	6.0				
USGS-59	USGS-59	1960	4914.5	657	0.0	49.0	12.0	464.00	657.00	6.0	OH
					49.0	291.0	10.0				
					291.0	464.0	8.0				
					464.0	657.0	6.0				
USGS-67	USGS-67	1960	4916.4	694	0.0	40.0	12.0	465.00	552.00	6.0	OH
					40.0	465.0	10.0	635.00	694.00	4.0	OH
					465.0	635.0	6.0				
					635.0	694.0	4.0				
USGS-77	USGS-77	1962	4922.7	610	0.0	126.0	12.0	470.00	610.00	6.0	OH
					126.0	470.0	10.0				
					470.0	610.0	6.0				
USGS-82	USGS-82	1962	4908.2	700	0.0	460.0	12.0	469.00	570.00	6.6	PS
					460.0	593.0	8.0	593.00	700.00	6.0	OH
					593.0	700.0	6.0				
USGS-84	USGS-84	1962	4938.8	505	0.0	84.0	12.0	324.00	505.00	6.0	OH
					84.0	324.0	10.0				
					324.0	505.0	6.0				
USGS-85	USGS-85	1962	4940.2	637	0.0	68.0	12.0	522.00	637.00	6.0	OH
					68.0	522.0	10.0				
					522.0	637.0	6.0				
USGS-111	USGS-111	1984	4920.3	595	0.0	440.0	10.0	430.00	442.00	8.0	PS
					440.0	595.0	8.0	442.00	600.00	8.0	OH
USGS-112	USGS-112	1984	4927.4	563	0.0	432.0	10.0	430.00	563.00	8.0	OH
					432.0	563.0	8.0				
USGS-113	USGS-113	1984	4924.9	564	0.0	445.0	8.0	443.00	561.00	6.0	OH
					445.0	564.0	6.0				

INEEL Name	Alias	Year Installed	Surface Elevation (feet)	Total Depth (feet	Borehole Diameter			Screen Information			Screen Type[a]
					Depth – top (feet)	Depth – bottom (feet)	Diameter (in)	Depth – top (feet)	Depth – bottom (feet)	Diameter (in)	
USGS-114	USGS-114	1984	4919.9	562.5	0.0	440.0	8.0	440.00	560.00	6.0	OH
					440.0	562.5	6.0				
USGS-115	USGS-115	1984	4918.7	581	0.0	440.0	8.0	437.00	580.00	6.0	OH
					440.0	581.0	6.0				
USGS-116	USGS-116	1984	4915.8	580	0.0	400.0	8.0	401.00	580.00	6.0	OH
					400.0	580.0	6.0				
USGS-121	USGS-121	1990	4910.5	745.8	0.0	39.2	16.0	449.00	475.00	6.0	SS
					39.2	444.0	11.9				
					444.0	495.2	7.9				
					495.2	533.0	3.7				
					533.0	745.0	3.0				
USGS-122	USGS-122	1990	4914.9	482.8	0.0	30.0	16.0	448.00	475.00	3.0	SS
					30.0	287.0	11.9				
					287.0	444.0	7.9				
					444.0	482.8	3.9				
USGS-123	USGS-123	1990	4920.1	744.2	0.0	40.0	16.0	449.50	475.30	6.0	SS
					40.0	442.0	11.9				
					442.0	503.0	7.9				
					503.0	744.2	3.7				
ICPP-MON-A-230	TF-AQ	2001	4912.4	523	0.0	42.5	24.0	443.00	483.00	6.0	SS
					42.5	219.0	19.0				
					523.0	219.0	15.0				
ICPP-MON-A-019	MW-18-4	1994	4913.7	492	0.0	46.4	24.0	458.5	478.5	4.0	PVC
					46.4	136.0	11.9				
					138.0	492.0	7.9				

a. OH = open hole.
PS = perforated steel.
PSS = perforated stainless steel.
PVC = polyvinyl chloride.
SS = stainless steel.